AMATEUR SATELLITE REPORT

Number 135
October 27, 1986

Editor: Vern Riportella, WA2LQQ
Contr. Editors:
Eric Rosenberg, WA6YBT
Pete Killingsworth, KD7WZ
Paul Roemer, KG6LC
Managing Editor: Bob Myers, W1XT

AMSAT's® *Newsletter for the Amateur Radio Space Program*

Amateur Satellite Report is endorsed by the American Radio Relay League as the special interest Newsletter serving the Amateur Radio Satellite Community

Copyright 1986 by AMSAT® , The Radio Amateur Satellite Corporation. AMSAT® is a registered trademark.

AMSAT OSCAR 10 Goes Silent

As we go to press, reports are accumulating indicating the possible QRT of AO-10. The last report received (from W5IU) indicates AO-10 was last heard at about MA 95 early on 12 October. Numerous subsequent observations report no sign of AO-10. The engineering and general beacons had been locked on and transmitting garble in recent weeks.

The silence could have several meanings. On the one hand, it could indicate the batteries have been depleted to the point where the bus voltage can no longer sustain beacon operation. On the other hand, the computer memory content is in rapid flux due to radiation damage. The bits controlling the beacons may simply have transitioned. If this is the case, the beacons could go on again unpredictably.

The main controlling element is, however, the sun angle. It was predicted to be poor enough by mid-October to cause power-down (or near power-down). Has the last been heard of AO-10? Perhaps. By early November, the tale shall have been told.

Short Bursts

- AMSAT's Board of Directors will meet November 9 and 10 in Dallas. The Board will be considering the 1987 Budget and the Phase 4 Program among other issues.
- ISKRA-4 is complete and ready to launch according to reports relayed by PAØDLO and G3IOR. PAØDLO visited with RW3DZ when the latter was in Holland recently.
- Observed operating schedules for RS-5 and RS-7 are in contrast to previously announced schedules: According to G3IOR, RS-5 is operating 1000 to 1400 UTC but is in very bad shape. RS-7 is operating from 0600 to 1000 UTC. Both are shut off on Wednesdays UTC.

Russian IFRB Filings for RS-9, 10?

Recent filings at the Geneva-based International Frequency Registration Board (IFRB) indicate the modes expected to be used for two new Russian Amateur Radio satellites, possibly RS-9 and RS-10. The frequencies include Mode A (2 meters up, 10 meters down); Mode K (15 meters up, 10 meters down) and Mode T, (15 meters up, 2 meters down).

According to initial reports, both new birds will be in lower orbits than prior RS's. These will fly at about 1000 km. Prior RS's were up at 1800 km where they brushed the lower levels of the Van Allen radiation belts. This may have shortened their operational life. At 1000 km they should survive longer but the price to be paid is poorer DX windows. In terms of coverage and trackability, they will be slightly better than AO-8 (900 km) and not as good as AO-7 (1457 km). Further details in an upcoming *ASR*.

TAPR Group to Offer JO-12 Mode JD Modems

by Tom Clark, W3IWI

This is a brief report on FO-12 PSK modem progress. The TAPRites (NØADI, WA7GXD & W3IWI) have been working on an adaptation of the JARL/JAMSAT PSK demodulator described in August 1986 *QEX*. (The *QEX* article only covers the "dem" part of the required modem).

Our plan is for TAPR to make this design available as a reproducible package — it has not yet been decided whether this will be a full kit or a semi-kit; if it is the latter, then all parts not supplied will be available from Radio Shack, JAMECO, or similar suppliers.

Details will be announced just as soon as they are decided. Please don't bug us about availability yet!

There are several differences (all additions) from the *QEX* design. The modem is designed to work with a TNC-1 (including Heath HD-4040 and AEA PK-1) or TNC-2 (including MFJ, Paccomm, AEA PK-80 & GLB TNC-2 clones) and connects thru the 20-pin "modem disconnect" header plus the normal radio I/O jack. The modem has an IN/OUT switch so that you can change between FO-12 and normal terrestrial operation without swapping any cables.

If you try to use this design with another type of TNC, you will have to insure that you have access to the RX data input to the TNC at TTL level bypassing the normal FSK demod. You will also have to provide the "raw" TTL level TX data and TX clock (either 16x or 32x baud rate). You should also provide a "carrier detect" input to the TNC (ac-

tive low) so that the TNC will know when the modem is locked up.

The modem has been designed with digital AFC to interface to any of the more modern all-mode radios. This involves having the radio make 10 Hz (e.g. with TS-811) or 20 Hz (e.g. with FT-726) steps using the inputs that allow you to step up/down from buttons on the microphone.

Our design includes two modulators: Manchester FSK as required for the FO-12 uplink and 1200 baud PSK. The PSK modulator has been included for two reasons — it lets you run loop-back tests with the PSK demod, and, more importantly, it allows Amateur experimentation with PSK packets. PSK should be 10-20 dB superior to the "Bell 202" AFSK-FM in common use on VHF. The composite PSK signal generated by the modulator is your normal digital data exclusive-or'd with an audio carrier in the 1400 to 1800 Hz range (exact frequency chosen to match you SSB radio's filters).

The design also includes LED "bar graph" indicators for both received signal level and tuning. The interface to the uplink radio are the normal TX audio and PTT lines. Your transmitter must operate in FM for the Manchester FSK FO-12 uplink or SSB for PSK use. On the receive side, your SSB receiver supplies RX audio to the demodulator and preferably should support digital frequency stepping for the AFC circuit described earlier.

I now have a fully functional prototype running. I want to thank Tak Okamoto (JA2PKI) for providing me with a JA-land circuit board which made my life a lot easier! I have been running local loopback tests and am convinced the basic design is sound. "Eye-patterns" on the PSK demod show that data filters are nearly optimal and lock-up time is quite acceptable.

The next step in my testing will involve cramming 1200 baud PSK thru ordinary commercial radios to characterize their performance. I have some concern about the filters in commonly used radios since I found a couple of years ago that a stock FT-726 was unsuitable for 1200 baud FSK work. Initial testing will be done on the Kenwood TS-711/811 pair and a FT-726. If someone wants to loan an IC-271/471 pair, we will gladly test them too. I am very anxious to find some other packeteer within 150 miles who has an FO-12 modem running so that I can make real "on-the-air" tests.

The other "next step" is to finalize the circuit board layout and test that implementation. We will keep you posted as this work proceeds.

Articles To Appear Celebrating OSCAR's 25th

This December marks the Twenty Fifth Anniversary of the launch of OSCAR-1. A number of articles will appear in various publications to mark the event.

QST will run a two-part article on 25 years of OSCAR with a special prospective on Phase 4 beginning in its December, 1986 issue.

"Air and Space" a brand new magazine published by the Smithsonian, will report on OSCARs in an up-coming edition. The article is based on extensive interviews with very experienced AMSAT contributors such as Dick Daniels, W4PUJ and Jim McKim, WØCY.

The Institute of Electrical and Electronic Engineers (IEEE) Aerospace and Electronic Systems Society Magazine plans to run a group of pictures of the various OSCARs on the cover of its December issue to celebrate the 25th anniversary of OSCAR. The editors have expressed an interest in running articles on OSCAR in future editions.

UoSAT OSCAR 9 Celebrates Fives Years In Orbit

by The University of Surrey Spacecraft Engineering Team

UoSAT OSCAR-9 was launched successfully by NASA at 11:27 UTC on 6th October 1981 on board a Delta 2310 rocket from the Western Test Range, Vandenberg Air Force Base, California. It was placed in a 554 km, 95 minute, polar, sun-synchronous Earth orbit. The satellite had taken 30 months to design, build, test and prepare for launch.

Shortly after separation from the DELTA launch vehicle, the spacecraft primary VHF data beacon was switched on and telemetry data received at the control station at Surrey. The satellite's first transmissions were also monitored eagerly by hundreds of Radio Amateurs around the world. Since then, many thousands of Radio Amateurs, school, college and university groups and other interested individuals in many countries have participated. They have taken part in the technical challenge of receiving, decoding and analysing the housekeeping and experimental data transmitted by the spacecraft.

UoSAT-1 experienced some difficulties between April & September 1982 when both downlinks were inadvertently activated, blocking the command uplinks. This problem was completely overcome with the assistance of SRI International in Menlo Park, California.

UO-9 now operates a regular series of daily experiments scheduled automatically by the On-Board Computer (OBC). The OBC schedule is loaded every two weeks by the Surrey Ground Control Station.

It is perhaps appropriate on the 5th Anniversary of its launch to summarise UO-9's mission objectives established when the project commenced:

They are:

1) To investigate the feasibility of, and the problems associated with, the design, construction, test and launch of a relatively small, inexpensive yet sophisticated spacecraft capable of a significant contribution to the engineering, scientific, educational and Amateur Radio communities.

2) To stimulate and promote a greater awareness of and interest in space engineering and science in schools, colleges and universities by direct, active participation in the satellite experimental programme. The satellite engineering and experiment data are transmitted in such a manner that they are readily received by, not only professional ground stations, but also simple, low-cost Amateur ground terminals.

3) To broaden the scope of the Amateur Satellite Programme by catering for the interests of the Amateur "experimenter-scientist" in addition to traditional Amateur Radio communications.

4) To evaluate the use and performance of novel technologies, spacecraft systems architectures and cost-effective spacecraft engineering techniques to provide a lower cost entry level into space activities.

The UO-9 mission has proved a remarkable success and the spacecraft continues to perform extremely well with no significant degradation thus far detected. The mission has experienced its "up-&-downs" but each difficulty has been overcome by perseverance resulting in "better" spacecraft operations and facilities. Indeed, sustained effort on spacecraft on-board computer software and ground control station facilities have resulted in enhanced performance from the spacecraft over the last year!

The UoSAT Team at the University of Surrey wishes to thank the thousands of experimenters worldwide who have sent in reports, experiment results, suggestions and general support for the mission — not forgetting those who helped us through difficult times!

At five years, UO-9 is the longest-living operational satellite in the Amateur Radio Satellite Service.

Arsene Project Status Report

Adapted by Eric Rosenberg, WA6YBT

[The following appeared in issue #39 (April, 1986) of MEGAHERTZ *magazine published by SORACOM, France. The English translation is Ross W. Forbes, WB6GFJ,/FOØFB and Richard Ley, FO5HL.]*

I. Arsene's Objectives for 1986

The objective of the Project Arsene group is to achieve a satellite and control station by the end of 1986. Discussions were held with ARIANESPACE at the start of 1986 to determine the first opportunity to launch the Arsene satellite.

II. Details of Honorary Recognition

The Federation Aeronautique International, at the time of their general conference at their session in New Delhi, presented a certificate of commendation for 1985. The honor went to the team in charge of the construction and control of Arsene.

This distinction was graciously received by the Arsene Group. After many difficult periods, their hard work was recognized by this important organization. In the past, this international organization, on two occasions, presented the first prize (gold medal) to student groups of young people for their work with Arsene. The first presentation was in Tokyo in 1980 and the second in Rome during 1981.

III. Frequencies of the "Arsene Repeater"

The Arsene satellite is a linear transponder of good dynamic design permitting multiple access by various stations using emissions less than 5 kHz in bandwidth. Types of signals allowed on the Arsene satellite include SSB, CW, RTTY and SSTV. Any station within visible range of the satellite will have the ability to contact other stations on the transponder.

An original design developed by the Arsene Project team is the partitioning of each transponder passband into one-quarter (25 kHz) segments. The purpose of the design is to limit the effects caused by those stations who continue to use excessive power when they access the satellite. The transponder is equipped with an independent AGC on each 25 kHz segment of each transponder. There are four AGC "filters" on the Mode B transponder.

The Arsene satellite will have two transponders on board; Mode B AND Mode F. The two transponders will not operate simultaneously, but rather alternate with each period of operation. The following table describes the frequencies used by the Arsene satellite.

Table 1: Frequencies for the Arsene Satellite

Mode B:	Actually 4 contiguous 25 kHz segments	
Uplink:	435.050 - 435.150 MHz	
Downlink:	145.850 - 145.950 MHz	
Mode F:	Actually 2 contiguous 25 kHz segments	
Uplink:	435.050 - 435.100 MHz	
Downlink:	2446.490 - 2446.540 MHz	
Beacons:	Mode B	145.830 MHz
	Mode F	2446.470 MHz

IV. Design Specifications of the Arsene Satellite

Before launch can occur, there are numerous design objectives which must be finalized. These include proper mechanical design to assure compatibility with the launch vehicle. These design requirements are specified in the manual called "Guide to the use of the Ariane Vehicle" (Manual de l'utilisatuer d'Ariane (MUA)). All users of Ariane must satisfy the design specifications. These assure the safety of the satellite from the effects of vibrations, accelerations, etc.

The structural design of Arsene was achieved in May of 1985 and was subjected to vibration tests and other observations. The satellite was then mounted on the adapter cone (#0937 type) developed by the team working with the APEX Ariane 4.

Table 2: Mechanical Details of the Arsene Satellite

Weight: 140 kg Height: 880 mm Diameter: 884 mm

Dimensions of the adapter:

Base Diameter: 1920 mm	Top Diameter: 937 mm
Height: 1079 mm	Weight: 100 kg

Vibration tests will be completed at the INTESPACE (Engenierie Test en Spatial Environment) in Toulouse (France). Structural tests took place from June 25 to 28 of 1985 at the centrifuge located at CESTA (Latecoere du Centre d'Essais Scientifique et Technique d'Aquitaine). Final testing of Arsene will make it possible to use either Ariane 3 or Ariane 4 as defined in the manual (MUA). The results of the qualification tests have been analyzed by "CNES" in Toulouse.

Astronaut Tony England, WØORE, To Appear at Symposium

AMSAT will hold its Fourth Annual Space Symposium and Annual Meeting at the Dallas/Fort Worth Airport Hilton Hotel November 7-9. Speakers at the Saturday Symposium include experts from around the world who will address the latest developments. Banquet Keynote Speaker is Dr. Marty Davidoff, K2UBC, satellite expert and author of the popular *Satellite Experimenter's Handbook*.

A very special guest during the weekend event will be Astronaut Dr. Tony England, WØORE. Tony's Ham-In-Space mission aboard shuttle STS-51F 29 Jul 85 directly touched thousands of Amateurs and would-be Amateurs across the globe. Tony will be on hand to informally share his views regarding the educational aspects of Amateur Radio especially in a space context. This will be a great opportunity for you to meet one of the world's most prominent Amateurs.

A special talk-in frequency has been established as: 145.17 MHz (down 600 kHz). Convention Chairman Al Brinckerhoff, WB5PMR, says the main course for the banquet will be London broil.

For further information you may call AMSAT Headquarters at 301-589-6062. The Planning Committee is doing a superb job of preparing for your visit with the best of Texas-style hospitality. This could be the best meeting ever, so y'all come down to Dallas this November 7, 8 and 9.

The following DRAFT program of activities has been provided by Planning Committee member, Bob Strickland, N5BRG. (Last minute changes possible).

Friday, 7 November

0900-1200	Depart Hilton Hotel for Surplus Stores Texas Instruments Rockwell Collins	
1200-1300	Lunch	Mercado Juarez Restaurant 1901 W NW HWY, Dallas
1300-1700	Thompson/MOSTEK Nortex	
1700-1830	Happy Hour	Hilton Hotel
1830-????	Barbecue	Hilton Ranch

Saturday, 8 November

0800-0810	Welcome	Vern Riportella, WA2LQQ
0810-0840	Fuji OSCAR 12	Harry Yoneda, JA1ANG
0845-0915	(TBS)	Tom Clark, W3IWI
0920-0945	Phase 3C Mode S Antenna	Hans Vande Groenendaal, ZS6AKV Hennie Rheeder, ZS6ALN
0945-1010	Break	
1010-1030	Digital AFC On IC-271/471	Phil Karn, KA9Q
1035-1050	Sat.Attitude Determination	James Miller, G3RUH
1055-1125	New Molniya Orbit Options	Bob McGwier, N4HY
1130-1200	Amplitude Compandored SSB	Jim Eagleson, WB6JNN
1200-1300	Lunch	
1300-1325	Houston Satellite Efforts	Gerry Creager, WB5FIV
1330-1400	UoSAT Telemetry Tracking	Bob Diersing, N5AHD
1400-1430	Phase 4 System Overview	Jan King, W3GEY
1430-1500	UoSAT Status and Future Projects	Martin Sweeting
1500-1515	Break	
1515-1545	Manned Space Opportunities	Bill Tynan, W3XO Lou McFadin, W5DID Dick Fenner, W5AVI
1545-1615	AO-10 Status Report	Ralph Wallio, WØRPK
1615-1645	Digital SatCom	Paul Rinaldo, W4RI
1700-1845	Social Hour	Attitude Adjustment
1900-2020	Banquet & Keynote Speaker	Marty Davidoff, K2UBC
2030-2200	Annual General Meeting (President's Report, Annual Awards and Banquet Prizes)	Vern Riportella, WA2LQQ

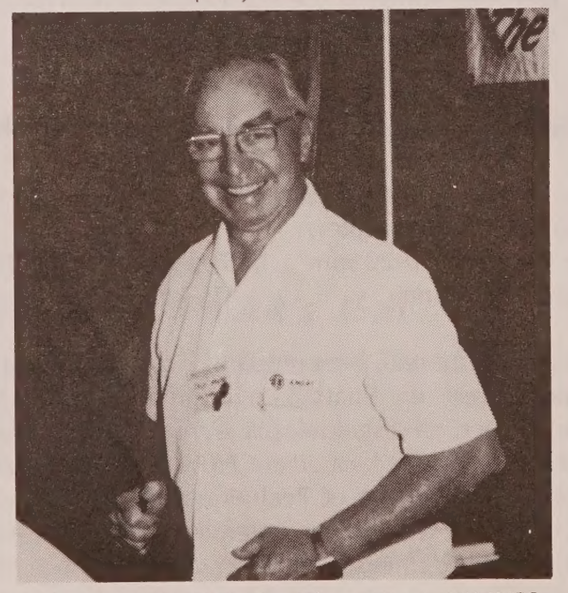
Sunday, 9 November

0800-0930	Antenna System Design	Harold D. Reasoner, K5SXK
1000-1130	Operating above 1 GHz	Al Ward, WB5LUA
0800-1130	Pre-amp Measurments	Richard Fogle, WA5TNY

AMSAT®

The Radio Amateur Satellite Corporation

Post Office Box 27
Washington, DC 20044
(301) 589-6062



At the AMSAT booth in San Diego 6 Sept., WA6VGS.

Non-Profit Organization Second Class POSTAGE PAID at Waterbury, Conn.

LM-1096 KA6M 99.81
MAGNUSKI, HANK
2019 BARBARA DR.
PALO ALTO CA 94303

Amateur Satellite Report (ISSN 0889-6089) is published biweekly for $16 (inseparable from annual membership dues of $24) by AMSAT, Post Office Box 27, Washington, DC 20044. Second class postage paid at Silver Spring, MD and additional mailing offices. POSTMASTER: send address changes to *Amateur Satellite Report*, Post Office Box 27, Washington, DC 20044.